

IN THE CLAIMS:

1 1. (Currently Amended) A rotary tool for drilling into a
2 soil formation from its surface, controllably injecting water and
3 dry binder at known depths below the surface of said formation,
4 and mixing said soil, water and dry binder to form an in-situ
5 piling, said tool comprising:

6 a rotary shaft having a central axis of rotation
7 adapted to be driven bi-directionally around said axis, and bi-
8 directionally along said axis;

9 a vane on and extending radially from said shaft to be
10 rotated around and moved axially by said shaft, said vane being
11 so disposed and arranged as to move through the formation along a
12 helical path to drill into said formation, to stir the material
13 of the formation, and ultimately to mix the material of the
14 formation with water and dry binder;

15 a water injector and a binder injector carried by said
16 tool, each injector having a respective axis of emission of water
17 or of dry binder, said axes of emission being directed away from
18 said tool into said formation at a respective location along said
19 central axis;

20 said injectors being so disposed and arranged relative
21 to one another that the material of their emissions will during a
22 limited number of revolutions of said shaft, encounter one
23 another, there to be mixed as a pre-determined ratio of water and

24 of dry binder, said water including water emitted from the water
25 injector and water which may have already been present at that
26 location;

27 said injectors being set in said shaft with their axes of
28 emission substantially normal to said central axis, and located
29 along said central axis such that the emission of one of them
30 will, within a limited number or rotations of the shaft encounter
31 and mix with the other in a temporally suitable time related to
32 the curing of the binder and drainage of the water;

33 there being a pair of said water injectors and at least one
34 of said binder injectors set in said shaft, with said binder
35 injector located axially between said water injectors.

1 Claim 2 (cancelled)

2 Claim 3 (cancelled)

3 Claim 4 (cancelled)

4 Claim 5 (cancelled)

5 Claim 6 (cancelled)

6 Claim 7 (cancelled)

7 Claim 8 (cancelled)

8 Claim 9 (cancelled)

1 10. (Previously Presented) In combination:

2 a rotary tool for drilling into a soil formation from its
3 surface, controllably injecting water and dry binder at known
4 depths below the surface of said formation, and mixing said soil,
5 water and dry binder to form an in-situ piling, said tool
6 comprising:

7 a rotary shaft having a central axis of rotation
8 adapted to be driven bi-directionally around said axis, and bi-
9 directionally along said axis;

10 a vane on and extending radially from said shaft to be
11 rotated around and moved axially by said shaft, said vane being
12 so disposed and arranged as to move through the formation along a
13 helical path to drill into said formation, to stir the material
14 of the formation, and ultimately to mix the material of the
15 formation with water and dry binder;

16 a water injector and a binder injector carried by said
17 tool, each injector having a respective axis of emission of water
18 or of dry binder, said axes of emission being directed away from
19 said tool into said formation at a respective location along said
20 central axis;

21 said injectors being so disposed and arranged relative
22 to one another that the material of their emissions will during a
23 limited number of revolutions of said shaft, encounter one
24 another, there to be mixed as a pre-determined ratio of water and

25 of dry binder, said water including water emitted from the water
26 injector and water which may have already been present at that
27 location;

28 a control valve respective to each of said injectors,
29 whereby the rate of supply of water and of dry binder can
30 independently be regulated by said control valves to provide
31 binder at a rate desired at a respective depth and water at a
32 rate desired which with existing water already in the formation
33 at that depth, will constitute at least sufficient water for
34 stoichiometric reaction of the binder;

35 said injectors being set in said shaft with their axes of
36 emission substantially normal to said central axis, and located
37 along said central axis such that the emission of one of them
38 will, within a limited number of rotations of the rotary tool
39 encounter and mix with the other in a temporally suitable time
40 related to the curing of the binder and drainage of the water.

1 Claim 11 (cancelled)

2 Claim 12 (cancelled)

3 Claim 13 (cancelled)

4 Claim 14 (cancelled)

5 Claim 15 (cancelled)

6 Claim 16 (cancelled)

7 Claim 17 (cancelled)

8 Claim 18 (cancelled)

9 Claim 19 (cancelled)

1 20. (Currently Amended) The method of forming an in-situ
2 piling in a soil formation with a dry binder and sufficient water
3 to produce a stoichiometrically correct mixture, comprising:

4 with a rotary tool, drilling into said formation, said
5 tool having a rotary shaft that has a central axis of rotation
6 and a vane for drilling into and mixing the soil, rotated around
7 and moved axially by said shaft, said vane being so disposed and
8 arranged as to move through the formation along a helical path to
9 drill into said formation, to stir the material of the formation,
10 and ultimately to mix the material of the formation with water
11 and binder;

12 a water injector and a dry binder injector carried by
13 said tool;

14 driving said tool axially into and out of said
15 formation while rotating it;

16 at some times during axial movement of said tool,
17 simultaneously discharging said water from said water injector
18 into said soil formation along an axis of emission of said water
19 and discharging said dry binder from said binder injection
20 injector into said soil formation along an axis of emission of
21 said dry binder under continuous control of the rate of supply of

22 each, both said axes of emission being ~~radiatly~~ directed away
23 from said shaft tool into said soil formation at a respective
24 location along said central axis of said shaft, so that said
25 water and said dry binder being emitted from said water injector
26 and from said binder injector, respectively, will during a
27 limited number of revolutions of said shaft encounter one another
28 to become a mixture at ~~various~~ respective depths with a as a
29 pre-determined ratio of water and dry binder, said ratio being
30 responsive to requirements at the respective depth, said
31 required water including water emitted from said water injector
32 and water which may have already been present at that depth in
33 said soil formation, said resulting mixture of water and binder
34 further including material of the soil formation. being
35 ~~temporatly~~-made-

1 21. (Original) The method of claim 20 in which injection of
2 binder is made during passage of said tool into said soil
3 formation.

1 22. (Original) The method of claim 20 in which injection of
2 binder is made during passage of said tool out of said soil
3 formation.

1 23. (Original) The method of claim 20 in which injection of
2 water is made during passage of said tool into said soil
3 formation.

1 24. (Original) The method of claim 20 in which injection of
2 water is made during passage of said tool out of said soil
3 formation.

1 Claim 25 (cancelled)

1 26. (Original) The method of claim 20 in which the emission
2 of one of said injectors is encountered in said soil formation in
3 a temporally suitable time related to the curing of the binder
4 and drainage of the water.

1 27. (Previously Presented) The method of claim 20 in which
2 the emission of water is determined by a program responsive to
3 data from a representative core.

1 28. (Original) The method of claim 20 in which the emission of
2 water is determined by a program responsive to data relating to
3 water content already in the soil derived from a sensor on said
4 tool disposed at an axial location below the place of injection
5 of said binder.

1 29. (Original) The method of claim 20 in which the pressure
2 of the stream of water and of the binder in the tool is above the
3 ambient pressure which exists in the formation.

Please add the following new claims:

1 30. (New) The method of claim 20 in which emission of water
2 and binder are under continuous control.

1 31. (New) A method according to claim 20 in which the
2 emission of water and binder are under continuous adjustable
3 control.